WHAT IS HAPPENING IN THE CALCULUS PROBLEM TO THE RIGHT?

$\ln(x^2+1) + \tan^{-1}(x) + k$

$\ln|u| + \int \frac{dx}{x^2+1}$

$\int \frac{du}{u} + \int \frac{dx}{x^2+1}$

$\int \frac{2x\,dx}{x^2+1} + \int \frac{dx}{x^2+1}$

$\int \frac{2x+1}{x^2+1}\,dx$

Inverse Trig Integrals

$\int \frac{1}{\sqrt{1-x^2}}dx = \sin^{-1}(x) + k \qquad \int \frac{1}{x^2+1}dx = \tan^{-1}(x) + k$

Match each indefinite integral with an anti-derivative.

1) $\int \frac{2}{x^2+1}dx$ D $2\tan^{-1}x$	2) $\int \frac{2}{\sqrt{1-4x^2}}dx$ $(2x)^2$ A	3) $\int \frac{1}{9x^2+9}dx$ G $\int \frac{1}{9(x^2+1)} = \frac{1}{9}\tan^{-1}x$	4) $\int \frac{3}{9x^2+1}dx$ $(3x)^2$ E
5) $\int \frac{1}{\sqrt{1-25x^2}}dx$ T $1-(5x)^2$	6) $\int \frac{1}{\sqrt{4-4x^2}}dx$ R $\sqrt{4(1-x^2)}$ $\frac{1}{2}\int \frac{1}{\sqrt{1-x^2}}$ $\frac{1}{2}\sin^{-1}x$	7) $\int \frac{8x}{\sqrt{1-4x^2}}dx$ T $(2x)^2$	8) $\int \frac{2x}{x^2+1}dx$ S
9) $\int \frac{1}{\sqrt{25-x^2}}dx$ N 25 $\frac{1}{5}\int \frac{1}{\sqrt{1-(\frac{x}{5})^2}}$	10) $\int \frac{3}{9x^2+9}dx$ I 9 $\frac{3}{9}\int \frac{1}{(\frac{x}{3})^2+1}dx$	11) $\int \frac{1}{\sqrt{25-4x^2}}dx$ I 25 $\frac{1}{5}\int \frac{1}{\sqrt{1+(\frac{2x}{5})^2}}$	12) $\int \frac{1}{9x^2+9}dx$ 9 $\frac{1}{9}\int \frac{1}{(\frac{3x}{3})^2+1}dx$

Indefinite Integrals.

A. $\sin^{-1}(2x) + k$	**B.** $\tan^{-1}(2x) + k$	**D.** $2\tan^{-1}(x) + k$	**E.** $\tan^{-1}(3x) + k$
F. $\frac{1}{3}\tan^{-1}(x) + k$	**G.** $\frac{1}{9}\tan^{-1}(x) + k$	**I.** $\frac{1}{2}\sin^{-1}(\frac{2x}{5}) + k$	**I.** $\tan^{-1}(\frac{x}{3}) + k$
K. $\frac{1}{5}\sin^{-1}(x) + k$	**N.** $\sin^{-1}(\frac{x}{5}) + k$	**O.** $\frac{1}{6}\tan^{-1}(\frac{2x}{3}) + k$	**R.** $\frac{1}{2}\sin^{-1}(x) + k$
S. $\ln\|x^2+1\| + k$	**T.** $-2\sqrt{1-4x^2} + k$	**T.** $\frac{1}{5}\sin^{-1}(5x) + k$	**Z.** $\frac{1}{x^2+1} + k$

D	I	S	I	N	T	E	G	R	A	T	I	O	N
1	11	8	11	9	7	4	3	6	2	5	10	12	9

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2) $u = 2x$

$du = 2\,dx$

$\int \frac{1}{\sqrt{1-u^2}}\,du$

$\sin^{-1}(2x) + k$

4) $u = 3x$

$du = 3\,dx$

$\int \frac{1}{u^2+1}\,du$

$\tan^{-1}(3x)$

5) $u = 5x$

$du = 5\,dx$

$\frac{1}{5}\,du$

$\frac{1}{5}\int \frac{1}{\sqrt{1-u^2}}\,du$

$\frac{1}{5}\sin^{-1}(5x) + C$

7) $u = 2x$

$du = 2\,dx$

$u = 1 - 4x^2$

$du = -8x\,dx$

$-\int \frac{1}{\sqrt{u}}\,du$

$-\int u^{-\frac{1}{2}}\,du$

$-2u^{\frac{1}{2}} + C$

$-2\sqrt{1-4x^2}$

8) $u = x^2 + 1$

$du = 2x\,dx$

$\int \frac{1}{u}\,du$

$\ln|x^2+1| + C$

9) $u = \frac{x}{5}$

$du = \frac{1}{5}\,dx$

$5\,du = dx$

$\frac{1}{5}\int \frac{5\,du}{\sqrt{1-u^2}}$

$\sin^{-1}u + C$

$\sin^{-1}\left(\frac{x}{5}\right) + C$

10) $u = \frac{x}{3}$

$du = \frac{1}{3}\,dx$

$3\,du = dx$

$\frac{1}{3}\int \frac{1}{u^2+1}\,3\,du$

$\tan^{-1}\left(\frac{x}{3}\right) + C$

11) $u = \frac{2x}{5}$

$du = \frac{2}{5}\,dx$

$\frac{5}{2}\,du = dx$

$\frac{1}{3}\int \frac{1}{\sqrt{1+u^2}}\,\frac{5}{2}\,du$

$\frac{1}{2}\sin^{-1}\left(\frac{2x}{5}\right) + C$

12) $u = \frac{2x}{3}$

$du = \frac{2}{3}\,dx$

$\frac{3}{2}\,du = dx$

$\frac{1}{9}\int \frac{1}{u^2+1}\,\frac{3}{2}\,dx$

$\frac{3}{18}\tan^{-1}\left(\frac{2x}{3}\right) + C$

$\frac{1}{6}$